User Input Devices' Impact on Virtual Desktop Trainers

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Report Documentation Page

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Agenda

- Introduction
- Background
- Methodology
- Results
- Recommendations

Introduction

- Motivation
- The Interface Issue
- Problem Statement
  - "When using a virtual desktop simulation for training, do commercial head tracking devices and game controllers improve training effectiveness?"

Background

- Literature Review
  - Evolution of game controllers
  - Use of Game controllers outside of video games
  - Personnel computers verses console video games
- Virtual Battlespace 2 (VBS2™)
- Sony PlayStation 3 game controller
- Natural Point TrackIR 5

Methodology

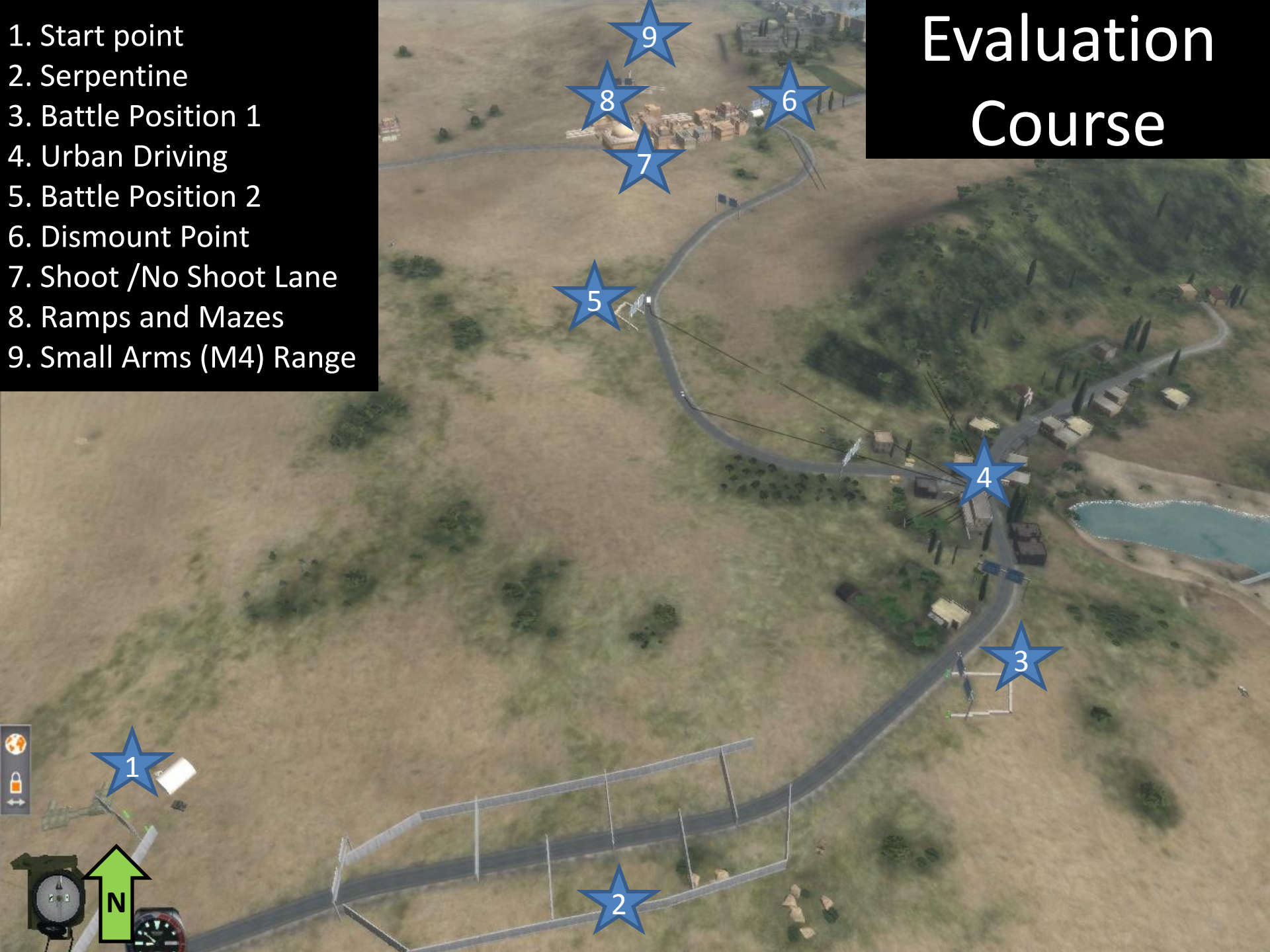
- Phases
  1. Define the scenario and determine how to measure performance
  2. Design and develop the scenario in VBS 2™
  3. Design data collection system
  4. Conduct simulation interface experiment
     a. Pilot Study
     b. Defense Language Institute (DLI) Study
  5. Evaluate results of the simulation interface experiment

Methodology

- Phase 1 - Define the scenario and determine how to measure performance
  - What is important?
  - Move, Shoot, & Communicate
  - Mounted, dismounted, or both?
  - Metrics
    - Time
    - Accuracy

Methodology

- Phase 2 - Design and develop the scenario in VBS 2™


1. Start point
2. Serpentine
3. Battle Position 1
4. Urban Driving
5. Battle Position 2
6. Dismount Point
7. Shoot /No Shoot Lane
8. Ramps and Mazes
9. Small Arms (M4) Range
Evaluation Course
1
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Methodology

- Phase 3 - Design data collection system
  - Automated Scoring System
    - JAVA Jar application written to capture VBS 2™ DIS data packets over network
    - Time
      - Crossing trigger lines times
      - Target hit times
    - Accuracy
      - Number of rounds fired
  - After Action Review Scoring System
    - Accuracy
      - Running off road, crashing vehicle, falling off ramps

Methodology

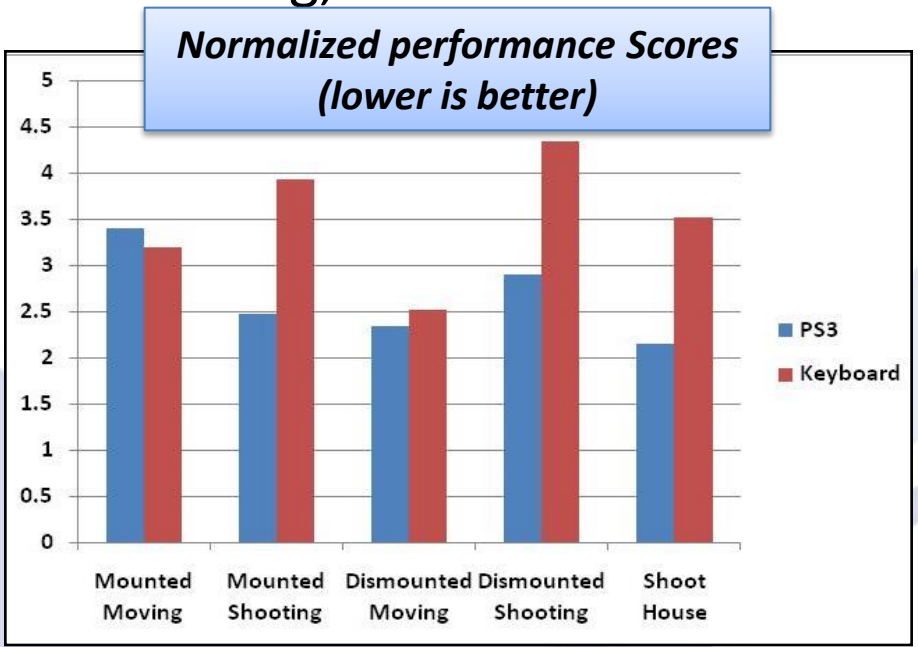
- Phase 4a - Conduct Pilot Study
  - 16 MOVES students conducted two session
    - First session with keyboard and mouse
    - Second session with PS3 game controller
    - TrackIR 5 was excluded
  - Lessons learned
    - Fine tuning of surveys, briefs, and evaluation courses
    - Keyboard and game controller function mapping
    - AAR recording and VBS2 Version Control
    - Automated scoring application

Methodology

- Phase 4b - Defense Language Institute Study
  - 53 total participants, 31 for PS3 Study, 22 for TrackIR Study
  - All participants were Army Soldiers (E-1 thru E-6) enrolled in language training at DLI
  - The average age was 24.4
  - 6 of the 53 were female
  - 34 of the 53 (64%) identified themselves as “Gamers”

Results

- Phase 5 - Evaluate results of the simulation interface experiment
  - The PS3 game controller outperformed the standard keyboard and mouse.
  - The PS3 improved overall performance, mounted shooting, dismounted shooting, and shoot house event scores.



t-Test: Paired two sample for Means (Matched)

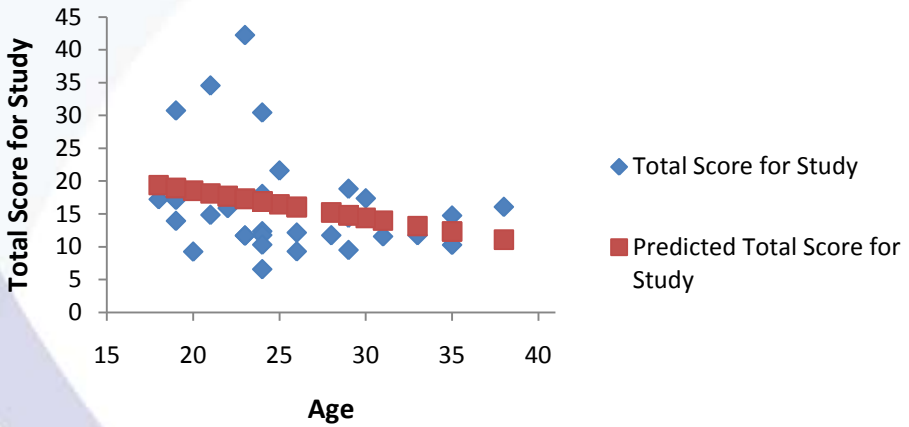
Event	PS3 Game Controller (Mean)	PS3 Game Control (Variance)	Keyboard and Mouse (Mean)	Keyboard and Mouse (Variance)	Two tailed P Value
Total Score	16.2	64.7	21.1	55.9	0.0004
Mounted Movement	3.4	4.1	3.2	4.2	0.615
Mounted Shooting	2.4	6.5	3.9	7.9	0.036
Dismounted Movement	2.3	3.8	2.5	3.0	0.314
Dismounted Shooting	2.8	3.2	4.3	3.6	0.004
Shoot House	2.15	3.13	3.5	5.16	0.0002

Results

- The NaturalPoint TrackIR 5 did not effect training performance.
- Preferences:
  - 56% preferred using the PS3 game controller
  - 54% preferred using the TrackIR 5 head tracker
  - 76% preferred using imagery over maps for navigation.

Methodology - Regression

Age vs PS3 Score Line Fit Plot

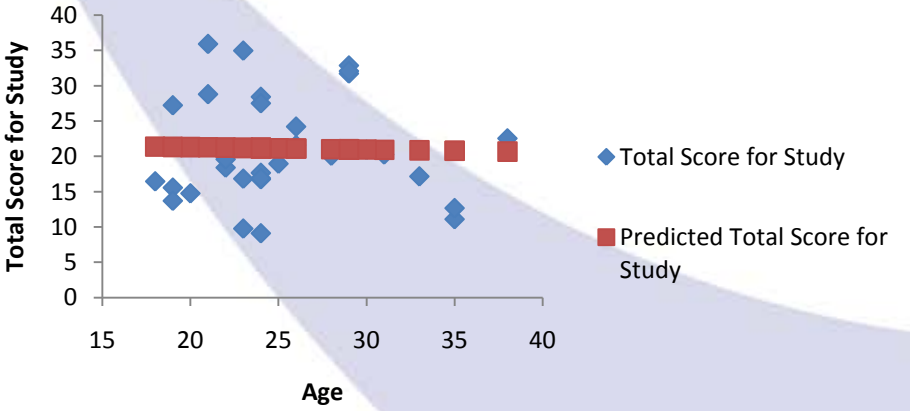


ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	137.00	137.00	2.20	0.15
Residual	29	1804.59	62.23		
Total	30	1941.59			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	26.83	7.24	3.71	0.00	12.03
Age	-0.41	0.28	-1.48	0.15	-0.99

Age vs KB Score Line Fit Plot



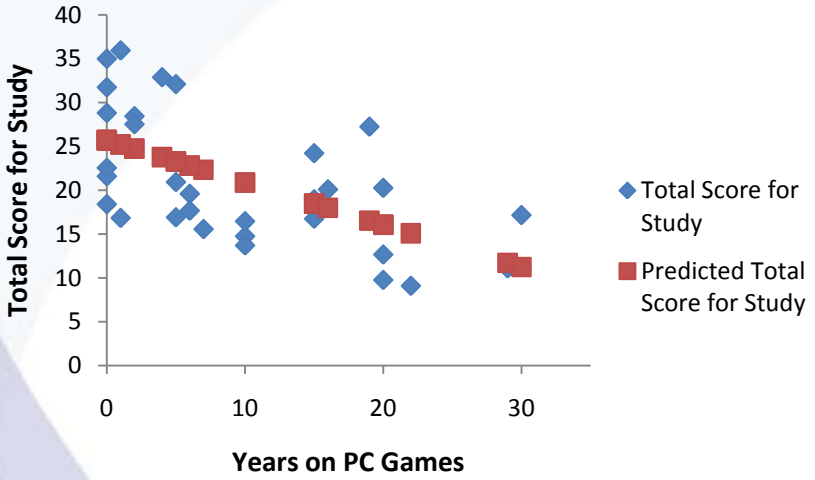
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.98	0.98	0.02	0.90
Residual	29	1676.47	57.81		
Total	30	1677.45			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	22.01	6.98	3.15	0.00	7.74
Age	-0.04	0.27	-0.13	0.90	-0.59

Methodology - Regression

Years on PC Games Line Fit Plot

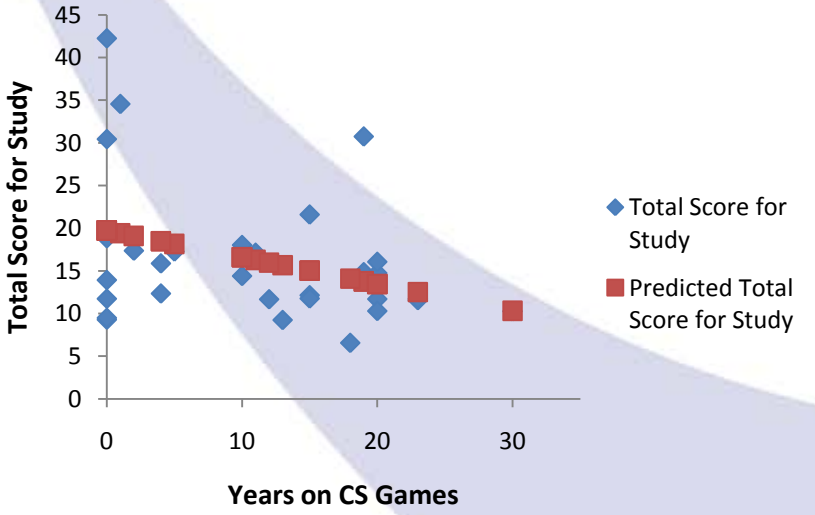


ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	566.20	566.20	14.78	0.00
Residual	29	1111.25	38.32		
Total	30	1677.45			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	25.71	1.63	15.75	0.00	22.37
Years on PC Games	-0.48	0.13	-3.84	0.00	-0.74

Years on CS Games Line Fit Plot



ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	232.78	232.78	3.95	0.06
Residual	29	1708.81	58.92		
Total	30	1941.59			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	19.73	2.21	8.93	0.00	15.21
years on CS Games	-0.31	0.16	-1.99	0.06	-0.64

Methodology - Regression

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	222.46	222.46	5.43	0.027
Residual	29	1187.89	40.96		
Total	30	1410.35			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*
Intercept	-9.27	6.15	-1.51	0.14	-21.86
Age	0.56	0.24	2.33	0.027	0.07

Recommendations

- Commander and BCTC Directors consider adding PS3 game controllers as an additional user input device.
- Commander and BCTC Directors do not consider adding TrackIR 5 as an additional user input device.

Questions?

Results

- Gamer stats
  - 34 of the 53 (64%) identified themselves as “Gamers”
  - The “non gamers” averaged 4.6 years of experience playing video games at 2.1 hours per week
  - The “Gamers” averaged 10.4 years of experience playing PC Games at 8.4 hours per week
  - The “Gamers” averaged 12.2 years of experience playing console video games at 9.7 hours per week
  - Many commented they would play more if not for learning a second language